**EuropeAnatolia Health Sciences Journal** E-ISSN: 2980-3861

**RESEARCH ARTICLE**
Volume:2 Issue:3 Year:2024 https://doi.org/10.5281/zenodo.14512825

# Changes In The Radial Styloid Bone: Can They Affect The Choice Of Treatment Method In De-Quervaın Tenosynovitis?

## Radial Stiloid Kemikte Değişiklikler: De-Quervain Tenosinoviti Hastalığında Tedavi Yöntemi Seçimini Etkileyebilir Mi?

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### ABSTRACT

**Introduction:** De Quervain tenosynovitis is a stenosing tenosynovitis of the Abductor Pollicis Longus (APL) and M. Extensor Pollicis Brevis (EPB) tendons located in the 1st dorsal compartment of the wrist, under the dorsal carpal ligament and radial tunnel. This research aimed to define and investigate the radial styloid bone changes and to evaluate which treatment option was applied to patients with bone changes.
**Method:** A total of 55 patients with De Quervain tenosynovitis were included in this study. Two separate radiologists analyzed the anterior-posterior wrist radiographs of patients at different times to investigate and define the radial styloid bone changes and evaluate which treatment option was applied to patients with radial styloid bone changes. The impact of treatment was assessed to determine the extent to which the appropriate treatment option can be decided for patients via X-ray.
**Results:** According to radiological imaging findings, changes were detected in the radial styloid bone in 72.2% of the patients, while no such changes were observed in 27.8%. The analyses show no significant relationship between X-ray findings and pre-FTR status, conservative or surgical treatment ($p>0.05$). The age variable was statistically significant in predicting X-ray changes ($p = 0.049$). The probability of X-ray changes increases with age ($p = 0.049$), which shows that age is an essential factor in X-ray changes.
**Conclusion:** Regarding the outcomes of this research, the age variable was statistically significant in predicting X-ray changes. The probability of X-ray changes increases with age, which shows that age is an essential factor in X-ray changes.

**Keywords:** De Quervain Tenosynovitis, Conservative Treatment, Physical Therapy and Rehabilitation, X-ray, Age.

### ÖZET

**Amaç:** De Quervain tenosinoviti, bileğin 1. dorsal kompartımanında, dorsal karpal ligament ve radyal tünel altında bulunan Abductor Pollicis Longus (APL) ve M. Extensor Pollicis Brevis (EPB) tendonlarının stenozan tenosinovitidir. Bu araştırmanın amacı, radyal stiloid kemik değişikliklerini tanımlamak ve incelemek ve kemik değişiklikleri olan hastalara hangi tedavi seçeneğinin uygulandığını değerlendirmektir.
**Yöntem:** Bu çalışmaya De Quervain tenosinoviti olan toplam 55 hasta dahil edildi. İki ayrı radyolog, radyal stiloid kemik değişikliklerini araştırmak ve tanımlamak ve radyal stiloid kemik değişiklikleri olan hastalara hangi tedavi seçeneğinin uygulandığını değerlendirmek için hastaların farklı zamanlarda çekilen ön-arka bilek radyografilerini analiz etti. Tedavinin etkisi, hastalar için uygun tedavi seçeneğinin direk grafi yoluyla ne ölçüde kararlaştırılabileceğini belirlemek için değerlendirildi.
**Bulgular:** Radyolojik görüntüleme bulgularına göre hastaların %72.2'sinde radyal stiloid kemiğinde değişiklikler tespit edilirken, %27.8'inde böyle bir değişiklik gözlenmedi. Analizler, direk grafi bulguları ile FTR öncesi durum, konservatif veya cerrahi tedavi arasında anlamlı bir ilişki olmadığını göstermektedir ($p>0.05$). Yaş değişkeni, direk grafi değişikliklerini tahmin etmede istatistiksel olarak anlamlıydı ($p = 0.049$). X-ışını değişikliklerinin olasılığı yaşla birlikte artmaktadır ($p = 0.049$), bu da yaşın direk grafi değişikliklerinde önemli bir faktör olduğunu göstermektedir.
**Sonuç:** Bu araştırmanın sonuçlarına göre, yaş değişkeninin direk grafi değişikliklerini tahmin etmede istatistiksel olarak anlamlı olduğu söylenebilir. Direk grafide gözlenen değişikliklerin olasılığı yaşla birlikte artar, bu da yaşın önemli bir faktör olduğunu gösterir.

**Anahtar Kelimeler:** De Quervain Tenosinoviti, Konservatif Tedavi, Fizik Tedavi Ve Rehabilitasyon, Direk Grafi, Yaş.

## INTRODUCTION

De Quervain tenosynovitis is a stenosing tenosynovitis of the Abductor Pollicis Longus (APL) and M. Extensor Pollicis Brevis (EPB) tendons located in the 1st dorsal compartment of the wrist, under the dorsal carpal ligament and radial tunnel. There are many factors in the etiology of De Quervain tenosynovitis. Excessive and repetitive movements of the thumb and wrist cause increased frictional

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Received: 31.10.2024, Accepted: 17.12.2024, Published Online: 20.12.2024
Cited: Kırgın G. Changes In The Radial Styloid Bone: Can They Affect The Choice Of Treatment Method In De-Quervaın Tenosynovitis? Europeanatolia Health Sciences Journal. 2024;2(3):70-77. https://doi.org/10.5281/zenodo.14512825

force and microtrauma, causing De Quervain tenosynovitis. De Quervain tenosynovitis is more likely to be seen between the ages of 30-60 and is 6-10 times more common in women than men (1).

Although the etiology of De Quervain tenosynovitis is not fully understood, many factors play a role in the etiology. In pathology, rather than acute inflammation of the synovial tissue, fibrous tissue accumulations and increased vascularity, together with myxoid degeneration, play a role. These accumulations cause thickening of the tendon sheath and painful effects on the APL and EPB tendons (2). In occupational groups that force the thumb into abduction and extension (knitting, prolonged keyboard use, prolonged phone-tablet use, use of musical instruments such as piano and guitar, continuous straining of the finger during excessive cleaning), microtraumas may cause De Quervain tenosynovitis (3). It is thought that repetitive movements performed during baby care in pregnant and breastfeeding women predispose to De Quervain disease. In challenging and repetitive situations, such as breastfeeding, grasping the baby's head, and carrying it in the same position, the position of the mother's hand causes tendon compression. In prolonged complaints, treatment may go as far as surgical intervention (4).

De Quervain's tenosynovitis may present symptoms such as pain caused by using the hand and thumb, localized tenderness in the radial styloid area, edema, Finkelstein's sign in positive extension of the thumb, and limitation and weakness in abduction. The pain and restriction resulting from De Quervain's tenosynovitis limit people's ability to use their hands functionally in daily life activities. De Quervain, among the occupational diseases, causes loss of work power (5). Conservative and surgical methods are utilized to treat De Quervain's tenosynovitis. Orthoses have an essential place in conservative treatment. When we look at the literature, we see that the thumb Spica orthosis is used more frequently in treating De Quervain's tenosynovitis. The thumb Spica orthosis prevents the patient from using his hand functionally because it covers the thumb and wrist. The short opponens splint does not restrict the hand's functionality because it only stabilizes the carpometacarpal (CMC) joint (6).

This research aimed to define and investigate the radial styloid bone changes (bone localization, periosteal reaction, sclerosis, osteopenia, erosion, and contour finding in the remaining epiphysis) and to evaluate which treatment option was applied to patients with bone changes.

## METHOD

A total of 55 patients with De Quervain tenosynovitis were included in this study. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Ethics committee approval was granted from our institution on 31/07/2024 with protocol number 1707/1687, and informed consent was obtained from all participants.

Among 190 patients who applied to our institution's Department of Orthopedics and Traumatology Department between 2019 and 2024 with de-Quervain tenosynovitis (n=55) were enrolled in this research. Two separate radiologists analyzed the anterior-posterior wrist radiographs of patients at different times to investigate and define the radial styloid bone changes and evaluate which treatment option was applied to patients with radial styloid bone changes. The impact of treatment was assessed to determine the extent to which the appropriate treatment option can be decided for patients via X-ray.

### Statistical Analysis

The data obtained in this study were analyzed using SPSS 24.0 (Statistical Package for the Social Sciences) software. Descriptive statistics of the data (number, percentage, mean, standard deviation, minimum and maximum values) were calculated, and patient characteristics were summarized. The chi-square test was applied to evaluate the relationships between categorical variables. Logistic regression analysis was used to determine the factors predicting X-ray changes. X-ray changes (0: No, 1: Yes) were considered dependent variables, and age, gender, pre-FTR treatment status, conservative treatment, surgical treatment, and affected side were used as independent variables. The logistic regression analysis

evaluated model fit with -2 Log-likelihood, Cox & Snell $R^2$, and Nagelkerke $R^2$ values. Results with a P value below 0.05 were considered statistically significant.

## RESULTS

According to gender distribution, of the 55 patients with De Quervain tenosynovitis included in the study, 68.5% were female, and 31.5% were male. The patients' ages ranged from 24 to 85, and the mean age was 48.04 ± 15.59 years. This distribution shows that the study covered a broad age group; the mean age was concentrated in the middle age group. Additionally, 96.3% of these patients did not receive physical therapy rehabilitation (PTR) and preoperative treatment. While the conservative treatment option was applied to 85.2% of the patients, this treatment was not used for 14.8%. The rate of patients receiving surgical treatment was 25.9%, and 74.1% did not undergo surgical intervention (Table 1).

**Table 1.** Baseline Demographic and Treatment of Study Population

| | | n | % |
|---|---|---|---|
| **Gender** | Female | 37 | 68,5 |
| | Male | 17 | 31,5 |
| **Pre-operative PTR** | No | 52 | 96,3 |
| | Yes | 2 | 3,7 |
| **Conservative treatment** | No | 8 | 14,8 |
| | Yes | 46 | 85,2 |
| **Surgery** | No | 40 | 74,1 |
| | Yes | 14 | 25,9 |
| **Dominant hand** | Right | 52 | 96,3 |
| | Left | 0 | 0,0 |
| | Bilateral | 2 | 3,7 |
| **Affected side** | Right | 25 | 46,3 |
| | Left | 27 | 50,0 |
| | Bilateral | 2 | 3,7 |
| **Change in X-ray** | No | 15 | 27,8 |
| | Yes | 39 | 72,2 |

PTR: physical therapy rehabilitation.

In the dominant hand distribution, 96.3% of the patients used their right hand as the dominant hand, while 3.7% had bilaterally affected hands. There were no patients who used their left hand as the dominant hand. Regarding the affected side, 50% of the patients had left wrist effects, 46.3% had right wrist effects, and 3.7% were affected bilaterally.

According to radiological imaging findings, changes were detected in the radial styloid bone in 72.2% of the patients, while no such changes were observed in 27.8%.

**Table 2.** Relationships Between X-ray Changes and Treatment Options

| | | Change in X-ray | | | | Chi-Square Test |
|---|---|---|---|---|---|---|
| | | No | | Yes | | |
| | | n | % | n | % | p-value |
| **Pre-operative PTR** | No | 15 | 28,8 | 37 | 71,2 | **0,518** |
| | Yes | 0 | 0,0 | 2 | 100,0 | |
| **Conservative treatment** | No | 2 | 25,0 | 6 | 75,0 | **0,610** |
| | Yes | 13 | 28,3 | 33 | 71,7 | |
| **Surgery** | No | 11 | 27,5 | 29 | 72,5 | **0,596** |
| | Yes | 4 | 28,6 | 10 | 71,4 | |

PTR: physical therapy rehabilitation.

The difference between pre-PTR treatment status and X-ray changes was insignificant (p = 0.518). X-ray changes were observed in 71.2% of patients who did not undergo PTR. While all patients who underwent PTR (100%) had X-ray changes, only two patients in the sample received treatment before FTR. X-ray changes were observed in 71.7% of patients who received conservative treatment, while this rate was 75.0% in patients who did not. This difference was also not statistically significant (p = 0.610). Relationship Between Surgical Treatment and X-ray Changes: X-ray changes were detected in

71.4% of patients who received surgical treatment, while this rate was 72.5% in patients who did not receive surgical treatment. This difference was not statistically significant (p = 0.596). The analyses show no significant relationship between X-ray findings and pre-FTR status, conservative or surgical treatment (p>0.05) (Table 2).

**Table 3.** Relationships Between X-ray Changes and Gender, Dominant Hand, and Affected Side

| | | Change in X-ray | | | | Chi-square Test |
|---|---|---|---|---|---|---|
| | | No | | Yes | | |
| | | n | % | n | % | p-value |
| **Gender** | Female | 10 | 27,0 | 27 | 73,0 | **0,550** |
| | Male | 5 | 29,4 | 12 | 70,6 | |
| **Dominant hand** | Right | 14 | 26,9 | 38 | 73,1 | **0,482** |
| | Left | 0 | 0,0 | 0 | 0,0 | |
| | Bilateral | 1 | 50,0 | 1 | 50,0 | |
| **Affected side** | Right | 8 | 32,0 | 17 | 68,0 | **0,480** |
| | Left | 6 | 22,2 | 21 | 77,8 | |
| | Bilateral | 1 | 50,0 | 1 | 50,0 | |

X-ray changes were detected in 73.0% of female and 70.6% of male patients. No statistically significant difference was found between gender and X-ray changes (p = 0.550). X-ray changes were observed in 73.1% of patients using the right hand as the dominant hand. This rate was found to be 50.0% in bilateral hand use. Although no patient used the left hand as the dominant hand, no statistically significant difference was found between dominant hand preference and X-ray changes (p = 0.482). X-ray changes were seen in 68.0% of patients with the right side affected and in 77.8% of patients with the left side affected. This rate was 50.0% in bilaterally affected patients. No significant relationship was found between the affected side and X-ray changes (p = 0.480). As a result, no statistically significant relationship was found between gender, dominant hand, and affected side and X-ray changes in the analyses performed (p > 0.05) (Table 3).

**Table 4.** The results of Lojistik Regresyon Sonuçları

| | Coefficient | sh | Wald | sd | p-value |
|---|---|---|---|---|---|
| **Age** | 0,049 | 0,025 | 3,869 | 1 | 0,049 |
| **Female** | 0,101 | 0,715 | 0,020 | 1 | 0,887 |
| **Pre-operative PTR (yes)** | 20,250 | 26645,449 | 0,000 | 1 | 0,999 |
| **Conservative (yes)** | -0,354 | 1,206 | 0,086 | 1 | 0,769 |
| **Surgery (yes)** | -0,642 | 1,087 | 0,348 | 1 | 0,555 |
| **Affected Side** | | | 0,764 | 2 | 0,682 |
| **Right** | 0,521 | 1,989 | 0,069 | 1 | 0,793 |
| **Left** | 1,044 | 1,981 | 0,277 | 1 | 0,598 |
| **Constant** | -1,668 | 2,930 | 0,324 | 1 | 0,569 |

PTR: physical therapy rehabilitation.

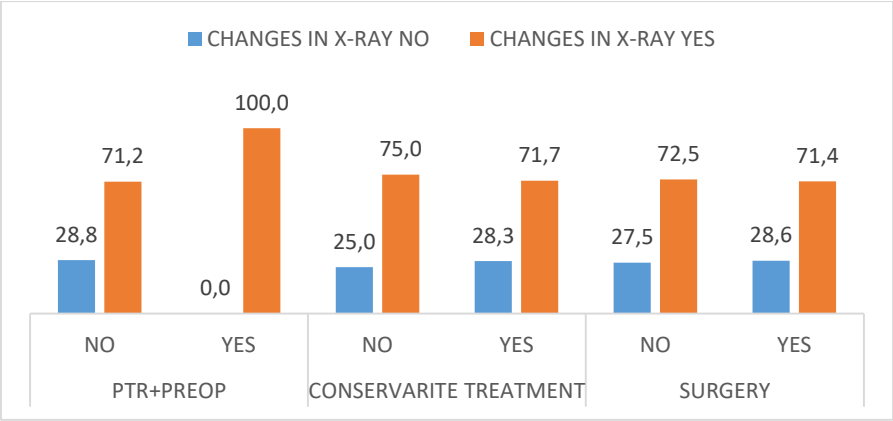


**Figure 1.** Relationship between X-ray findings and beforephysical therapy rehabilitation R status, conservative treatment and surgical treatment

The age variable was statistically significant in predicting X-ray changes (p = 0.049). The probability of X-ray changes increases with age (p = 0.049), which shows that age is an essential factor in X-ray changes. The gender (female) variable did not significantly correlate with X-ray changes (p = 0.887). This result shows that the female gender does not have a determining effect on X-ray changes. The Pre-PTR Treatment variable was insignificant despite showing a very high coefficient value in the analysis (p = 0.999). This situation reveals that receiving treatment before PTR does not affect X-ray changes. The Conservative Treatment and Surgical Treatment variables were also insignificant in predicting X-ray changes (p = 0.769 and p = 0.555). This finding shows that these treatment options do not have a substantial relationship with X-ray changes (Table 4).

As a result, age was a significant factor in predicting X-ray changes in this logistic regression model, while other variables were not significant.

## DISCUSSION

The first dorsal compartment is a fibroosseous tunnel located on the radial styloid. It contains the long abductor of the thumb, abductor pollicis longus (APL), and the short extensor, extensor pollicis breg. The pelvic muscle is located inside. The tunnel is approximately 1 cm long. It occurs due to nodular thickening of the abductor pollicis longus and pelvic muscle tendons and their compression within the canal (7)]. The studies observed that the compartment was frequently divided into two by vertical septa extending from the radius to the extensor retinaculum. The APL was generally located on the palmar side, and the pelvic muscle on the dorsal side. Previous studies stated that these two tendons were located in two separate channels in 17-40% of the cases. Often, the APL tendon was present in more than one case. Two channels are frequently seen in De Quervain patients (8). Two separate channels were reported in 17-40% of the cases in clinical studies. The channel on one side contains the pelvic muscle, and the channel on the other contains the APL tendons. Some studies have also mentioned a third channel (9).

Studies on De Quervain's tenosynovitis suggest that De Quervain's tenosynovitis is caused by a mechanically narrowed fibro-osseous canal, resulting in a mechanical compression of the tendons and the narrowed fibro-osseous canal. This compression causes increased tension on the abnormal retinaculum, stimulating nociceptors and resulting in pain. This pathophysiological model explains why splinting is an effective way to manage symptoms. It prevents the tendon from sliding within the abnormal fibro-osseous canal and compresses the tendon retinaculum. Patients usually feel pain over the radial styloid, and this pain increases particularly with thumb movements. They feel pain when lifting and grasping objects with the wrist in a neutral position. There are provocative tests to make the diagnosis (10). The first is the Finkelstein test. In this test, when the patient grasps the thumb and abducts the wrist to the ulnar side, the increase in pain indicates that the test is positive. EPB is a test that shows tendon pathologies more than APL. The pain increases when the patient grasps the thumb, which causes ulnar deviation, and the pain is relieved when the patient opens the thumb in this position. This is also known as the Eichhoff maneuver, another test that helps make a diagnosis (11). De Quervain's tenosynovitis is often a self-limiting disease. Most patients are relieved with non-surgical methods. These methods include rest, non-steroidal anti-inflammatory drugs, splinting, physical therapy modalities, and steroid injections into the tendon sheath. Relaxation of the first extensor compartment is recommended in resistant cases that do not respond to non-surgical treatments (12).

Conservative treatment methods are quite effective in relieving pain and increasing joint movements in De Quervain's disease, especially in acute cases. In our study, 96.3% of these patients did not receive physical therapy rehabilitation (PTR) and preoperative treatment. Current non-surgical methods commonly include hand physical therapy, thumb spica splints to immobilize the irritated tendons, anti-inflammatory non-steroidal anti-inflammatory drug (NSAID) prescriptions, and corticosteroid injections to reduce the inflammatory swelling and irritation of the APL/EPB tendons (13). Surgical methods are applied in symptomatic cases with conservative treatment. Surgery can be performed with open or endoscopic techniques. In our study, the conservative treatment option was applied to 85.2% of

the patients. This treatment was not used for 14.8%. The rate of patients receiving surgical treatment was 25.9%, and 74.1% did not undergo surgical intervention. Various complications can also be seen due to surgical procedures. These are cephalic vein injury, radial nerve sensory branch injury, tendon subluxations, painful wound scar tissue, and wound problems (14) Iatrogenic radial nerve sensory branch injury is among the most common complications. Endoscopic release surgery reduces these complications, which are more common in open surgery. After surgery with the endoscopic method, there is less pain in the early period and more patient satisfaction due to the small wound area. In addition, Poublon et al. stated that there are many variations of the radial nerve sensory branch; therefore, it is not a safe area (15).

In the cadaver study of Jackson et al. (16), EPB was absent in 2% of the cases, and Brunelli's study (17) in 4%. In the study of Witt et al. (18), it was determined that the pelvic muscle was in separate channels during surgical treatment in 73% of the cases treated conservatively and with unsuccessful results. In the instances showing recurrence, it was observed that there were two separate channels in four patients during the second surgery. Eidelmann et al. (19) found that patient dissatisfaction is significantly associated with disease recurrence or long-term complications. Consequently, reintervention in these cases is sometimes inevitable. Although different studies have shown multiple predisposing risk factors for Quervain's syndrome, there are almost no studies focusing on possible risk factors that influence patient-reported outcomes following de Quervain's release. Eidelmann et al. reported that 80% of dissatisfied patients in their cohort had recurrent disease or postoperative complications and a clear explanation for persistent pain. The remaining 20% in that study did not have an apparent reason for their persistent pain. Still, the authors reported all were either workman's compensation patients or being treated for psychiatric diseases (19).

Although diagnosis is apparent, standard posteroanterior (PA) wrist radiography is essential to prevent the misdiagnosis of arthritic changes, a fracture, or a tumor by considering the similar localization of pain. At the same time, most patients describe repetitive trauma (20). Chien et al. (21) reported that some radiographic findings of the radial styloid, such as focal cortical erosion, sclerosis, or periosteal bone resorption, should suggest de Quervain's tenosynovitis. After almost 9 years, Suresh et al. (22) found that radial styloid abnormalities did not affect management. Recently, Henry et al. (23) published no significant differences in surgery rates with positive X-ray findings. However, there is still insufficient data about the radiographic findings of de Quervain's tenosynovitis patients and their contribution to patient management. Chien et al. (21) showed that the focal radial styloid abnormality at the first dorsal wrist compartment was significantly associated with de Quervain's tenosynovitis. Additionally, Suresh et al. (22) reported that radial styloid abnormality was not statistically significant in patients with de Quervain's tenosynovitis and did not affect the management outcome. In addition, Henry et al. (23) published no significant differences in surgery rates with positive X-ray findings. According to the radiological imaging findings of our study, changes were detected in the radial styloid bone in 72.2% of the patients, while no such changes were observed in 27.8%. Previous research states that surgery for nontraumatic upper extremity conditions is mostly discretionary and preference-sensitive (24).

## CONCLUSION

Regarding the outcomes of this research, one can say that age variable was statistically significant in predicting X-ray changes. The probability of X-ray changes increases with age, which shows that age is an essential factor in X-ray changes.

## DESCRIPTIONS

**No financial support.**

**No conflict of interest.**

**AI Statement: The authors used AI and AI-assisted Technologies (Grammarly and MS Word Editor) in the writing process. These technologies improved the readability and language of the work. Still, they did not replace key authoring tasks such as producing scientific or medical insights, drawing scientific conclusions, or providing clinical recommendations. The authors are ultimately responsible and accountable for the contents of the whole work.**

**Consent for Publication: The original article is not under consideration by another publication, and its substance, tables, or figures have not been published previously and will only be published elsewhere.**

**Data Availability: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.**

**Ethical Declaration: All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Our institution has granted ethics committee approval. As this was retrospective research, no informed consent was obtained from participants.**

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